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(Cypress Hills Formation, Oligocene, Chadronian) Saskatchewan

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by John E. Storer

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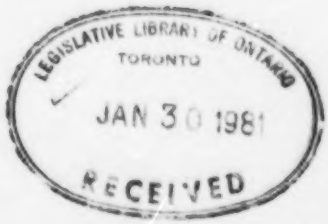


Lagomorphs of the Calf Creek Local Fauna (Cypress Hills Formation, Oligocene, Chadronian) Saskatchewan

John E. Storer

The lagomorphs *Palaeolagus temnodon* and *Megalagus* near *M. brachyodon* are present in the Calf Creek Local Fauna (Chadronian: Oligocene), Cypress Hills Formation of Saskatchewan. The Calf Creek populations show "primitive" characteristics in premolars, as compared to previously reported samples. Calf Creek lagomorphs indicate an age for the local fauna that is older than the Pipestone Springs Local Fauna of Montana, and possibly older than the levels at Flagstaff Rim, Wyoming, from which large lagomorph samples have been reported.

(Lagomorpha: Oligocene: Saskatchewan)

INTRODUCTION

The Calf Creek Local Fauna has yielded an extensive sample of fossil lagomorphs. Despite Russell's recent description of Cypress Hills samples (1972, p.12-19), I feel that discussion of the Saskatchewan Museum of Natural History collection, which contains good examples of premolars of both taxa, will add refinement to the identifications, and to faunal correlation.

Background data on the local fauna, and on Saskatchewan Museum of Natural History specimens described here (prefix P) were given in an earlier paper (Storer 1978).

METHODS AND MATERIALS

Measurements are crown maxima taken parallel to the

occlusal surface, were made with hand-held dial calipers (Fowler type 6921), and are given to the nearest 0.1 mm.

Buccolingual measurements of the curved, unilaterally hypsodont upper cheek teeth were made arbitrarily, and are probably not reproducible. They are crown maxima taken as close to a line parallel to the occlusal surface as I could hold my calipers. Whatever method of measuring these teeth one adopts, it seems impossible to compensate for the buccolingual widening caused by the lingual root's rotation about the buccal roots during wear.

Illustrations were made by James S. McLean, of Moose Jaw. Relative sizes of specimens are indicated by 1 mm scale bars.

Measurements are given in paragraph form. The object measured is given first, then the measurement (AP, anteroposterior diameter; BL, buccolingual diameter; BL ant, buccolingual diameter of anteroloph; BL post, buccolingual diameter of posteroloph; BL tri, buccolingual diameter of trigonid; BL tal, buccolingual diameter of talonid), with number of specimens in parentheses, and mean, observed range (OR), and coefficient of variation (CV).

SYSTEMATIC DESCRIPTION

Family Leporidae

Palaeolagus temnodon

Referred specimens: LdP^2, P1585.514, P1585.516; RdP^2, P1585.517-519, P1585.521-522, P1585.608; LP^2, P661.175-178, P1585.515, P1585.524-527, P1585.529-530; RP^2, P661.179, P1585.531-533; LdP^3, P661.180, P1585.534-535; RdP^3, P1585.537-542, P1585.610; LP^3, P661.181-188,

P1585.536, P1585.543-544; RP^3, P661.189-196; LdP^4, P1585.545-547; RdP^4, P661.197-189, P1585.548-549; LP^4, P661.206-212, P1585.550; RP^4, P661.213-222; LM^1, P661.223, P1585.551; RM^1, P661.224-233, P1585.552; LM^2, P661.234-237; RM^2, P661.238-243; LM^3, P661.244, P1585.553-554; RM^3, P1585.555-558; R. maxillary with RP^4, P661.200; L. maxillary with LP^4, LM^1, P661.201; R. maxillary with RP^4, RM^1, P661.202; L. maxillary with LP^4, LM^{1-2}, P661.203; L. maxillary with LM^{1-2}, P661.204; L. maxillary with alveoli for LP^{3-4}, LM^{1-2}, P661.205; LdP_3, P1585.559-560; RdP_3, P661.390, P1585.561-564; LP_3, P661.245-249, P661.335, P1585.565-567; RP_3, P661.250-256, P661.272, P661.309, P661.364, P1585.568-570; LdP_4, P1585.574, P1585.576, P1585.611; RdP_4, P661.257, P1585.571-572, P1585.581-582, P1585.593, P1585.614; LP_4 or M_1 or M_2, P661.265-271, P661.273-294, P661.296-307, P661.310-331, P1585.573, P1585.575, P1585.577-580, P1585.612; RP_4 or M_1 or M_2, P661.332-334, P661.336-363, P661.365-389, P1585.580, P1585.583-592, P1585.594, P1585.613; LM_3, P1585.595-603; RM_3, P1585.604-607; L. mandible with LP_{3-4}, LM_{1-2}, P661.258-259; R. mandible with RP_4, RM_1, P661.260.

Description: In dP^2, the lingual lobe extends barely farther anterad than the central lobe, and has a distinct lingual notch. The buccal lobe is distinct, and merges with the central lobe late in wear.

The central lobe of P^2 is the most prominent. A lingual notch in the lingual lobe disappears in very early wear. The valley between the central and lingual lobes is the most persistent, and extends nearly to the crown base. The buccal lobe, though prominent, is much shorter-lived than the lingual lobe. Nearly all worn teeth are triangular in crown outline. Ten of 13 teeth

that are well preserved show no anterobuccal projection from the lingual lobe (Gawne 1978, p.1110).

dP^{3-4} are very much shorter-crowned versions of P^{3-4}. Unworn deciduous teeth are not represented in the Calf Creek collection.

In P^3 the lingual lobe projects nearly as far buccad as the central lobe. The hypostria is short-lived and lies in the posterior half of the crown. In seven of nine well-preserved teeth, the lingual and buccal lobes fail to connect and the central lobe reaches the buccal surface (Gawne 1978, p.1110).

P^4 - M^2 are as described by Russell (1972, p.13-14). M^3 is a very small tooth with a two-lophed pattern that quickly wears to isolate a small fossette near the centre of the crown.

In dP_3 the talonid unites medially with the trigonid, and is free at both ends. dP_4 is as described for *Palaeolagus temnodon* by Wood (1940).

P_3 varies in pattern as do teeth of *P. temnodon* figured by Wood (1940, figs. 86-91).

P_4 - M_2 are as described by Russell (1972, p.15). M_3 differs little from P_4 - M_2 except in its smaller size.

There is no cement on these teeth, except in the deepest valleys. P^3 - M^2 show curved columns, though normally not as strongly curved as in *Megalagus*.

Discussion: These teeth agree with the type sample of *Palaeolagus temnodon* from the Pipestone Springs Local Fauna of Montana in size, height of crown, and most features of occlusal pattern, and are definitely referable to that species.

"Primitive" variants of pattern in P^2 (lack of an anterobuccal projection from the lingual lobe) and

P^3 (failure of the lingual and buccal lobes to meet along the buccal wall) appear in the Calf Creek population at far greater frequencies than in the populations from Flagstaff Rim, Wyoming and Pipestone Springs, Montana (Gawne 1978, p.1110). It appears that the Calf Creek population is more "primitive," and may represent a slightly earlier time, than either of the previously reported samples.

Measurements: dP^2, AP(8), mean 1.4, OR 1.3-1.6, CV 7.1; BL(8), mean 2.0, OR 1.8-2.2, CV 5.0. P^2, AP(15), mean 1.5, OR 1.3-1.8, CV 6.7; BL (14), mean 1.9, OR 1.6-2.1, CV 10.5. dP^3, AP(9), mean 1.8, OR 1.6-1.9, CV 5.6; BL ant (6), mean 2.6, OR 2.4-2.7, CV 3.8; BL post (6), mean 3.1, OR 2.8-3.3, CV 6.5. P^3, AP(18), mean 2.1, OR 2.0-2.2, CV 4.8; BL ant (13), mean 2.8, OR 2.2-3.3, CV 10.7; BL post (12), mean 3.4, OR 2.8-4.0, CV 11.8. dP^4, AP(6), mean 1.8, OR 1.6-2.0, CV 5.6; BL ant (3), mean 3.1, OR 2.9-3.3; BL post (3), mean 3.0, OR 2.7-3.2. P^4, AP (19), mean 2.1, OR 1.9-2.3, CV 4.8; BL ant (9), mean 3.6, OR 3.0-4.3, CV 13.9; BL post (11), mean 3.6, OR 3.2-4.3, CV 11.1. M^1, AP(15), mean 2.1, OR 1.8-2.3, CV 4.8; BL ant (12), mean 3.5, OR 2.9-4.1, CV 11.4; BL post (13), mean 3.4, OR 2.6-4.3, CV 14.7. M^2, AP (12), mean 1.9, OR 1.7-2.1, CV 5.3; BL ant (9), mean 3.3, OR 2.8-4.1, CV 12.1; BL post (9), mean 3.0, OR 2.5-3.9, CV 13.3. M^3, AP(6), mean 1.1, OR 1.0-1.2, CV 9.1; BL(5), mean 2.0, OR 1.8-2.1, CV 5.0. dP_3, AP(5), mean 2.5, OR 2.3-2.7, CV 8.0; BL tri(6), mean 1.6, OR 1.4-1.9, CV 12.5; BL tal (6), mean 1.9, OR 1.6-2.1, CV 10.5. P_3, AP(22), mean 2.3, OR 1.7-2.5, CV 8.7; BL tri(23), mean 1.7, OR 1.4-1.9, CV 5.9; BL tal(23), mean 1.9, OR 1.6-2.2, CV 10.5. dP_4, AP(6), mean 2.3, OR 2.2-2.7, CV 8.7; BL tri(8), mean 1.8, OR 1.6-1.9, CV 5.6; BL tal(8), mean 2.0, OR 1.7-2.3, CV 10.0. P_4, AP(3), mean 2.3,

OR 2.2-2.3; BL tri (3), mean 2.6, OR 2.4-2.8; BL tal (3), mean 2.0, OR 1.9-2.1. M_1, AP(3), mean 2.4, OR 2.2-2.5; BL tri (3), mean 2.6, OR 2.5-2.7; BL tal (3), mean 2.0, OR 1.9-2.2. M_2, AP (2), mean 2.6, OR 2.4-2.8; BL tri (2), mean 2.6, OR 2.5-2.6; BL tal (1), 1.8.
P_4 or M_1 or M_2, AP (112), mean 2.5, OR 2.2-3.0, CV 4.0; BL tri (112), mean 2.6, OR 2.1-3.0, CV 7.7; BL tal (119), mean 2.1, OR 1.6-2.4, CV 9.5. M_3, AP (12), mean 1.3, OR 1.0-1.5, CV 7.7; BL tri (11), mean 1.5, OR 1.2-1.7, CV 6.7; BL tal (11), mean 1.1, OR 1.0-1.3, CV 9.1.

Megalagus near *M. brachyodon*
Referred specimens: LdP^2, P1585.513; RdP^2, P1585.520; LP^2, P661.143-144, P661.295, P1585.528, P1585.609; RP^2, P661.145-146, P1585.498, P1585.523; LP^3, P661.147; RP^3, P661.148; LP^4, P661.149; RP^4, P661.150-151; LM^1, P661.152-153, P1585.499; LM^2, P661.154; RM^3, P661.155; LP_3, P661.156; RP_3, P661.157-158; LP_4 or M_1 or M_2, P661.159-164, P661.308, P1585.501-509; RP_4 or M_1 or M_2, P661.165-173, P1585.510-512; LM_3, P661.174.

Description: The Calf Creek sample consists entirely of isolated teeth, but apparently all positions in the permanent cheek-tooth series and dP^2 are represented.

dP^2 (Fig. 1A,B) is somewhat like the corresponding tooth of *Mytonolagus wyomingensis* (Dawson 1969, fig.11) in showing the central lobe projecting farther anterad than the lingual lobe: this is the reverse of the condition seen in *Palaeolagus*. In *Megalagus* near *M. brachyodon*, however, the buccal lobe is larger and the lingual lobe less curved than in *Mytonolagus*, and in one specimen (Fig. 1B) a small, ephemeral valley lies posterior to the central lobe.

P^2 (Fig. 1C-E) is made up of three lobes that are separated by narrow but deep valleys. Basally the largest of the three, the central lobe projects anterad, and is separated from the lingual lobe by a valley that nearly reaches the posterior crown border in unworn specimens. In six of seven well-preserved teeth a strong anterobuccal projection extends from the lingual lobe (Gawne 1978, p.1112).

The buccal lobe of P^2 is nearly as large as the lingual lobe, and is directed anterobuccad. With progressive wear the buccal lobe decreases in relative size, merging in some specimens with the central lobe. Variation in relative depths of the valleys is seen in the sample: the lingual valley is the deeper in seven specimens, the buccal valley is the deeper in one, and the valleys are of about equal depth in one. In two worn teeth, a small enamel lake is isolated posterobuccal to the lingual valley (Fig.1D).

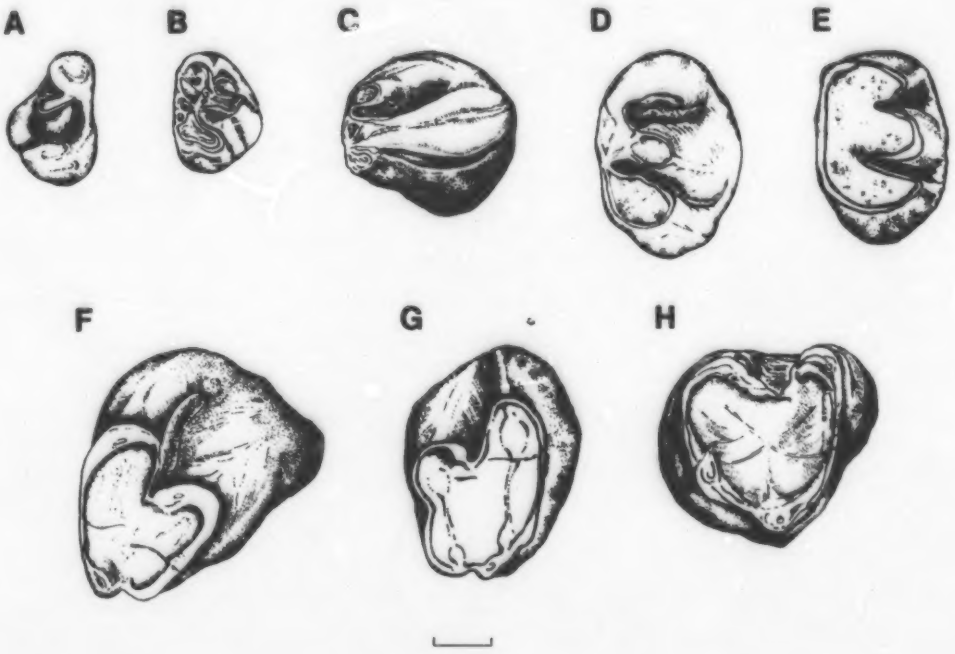
P^2 of *Megalagus* near *M. brachyodon* cannot be separated by size alone from corresponding teeth of *Palaeolagus temnodon:* the lower crown height of *Megalagus* is the most dependable criterion. P^2 from Calf Creek are also much lower crowned than P^2 of the type population of *M. brachyodon* from Pipestone Springs. Crown height of SMNH P66l.146 is 2.9 along the anterior face, and American Museum of Natural History 9652, the holotype of *M. brachyodon,* though in approximately the same stage of wear, shows a crown height of 3.8.

Worn P^2 of *M.*near *M. brachyodon* are nearly always D-shaped in occlusal outline. A unique variant (Fig.1E) is nearly rectangular, with all three lobes directed anterad.

In P^3, the lingual lobe does not reach the buccal

Fig. 1. *Megalagus* near *M. brachyodon*, cheek teeth. Buccal to top of page, anterior to left in A,G,H, to right in B,C,D,E,F. Scale 1 mm.

A. LdP^2, P1585.513; B. RdP^2, P1585.520;
C. RP^2, P1585.523 (anterior-oblique view);
D. RP^2, P661.146; E. RP^2, P661.145;
F. LP_3, P661.156; G. RP_3, P661.157;
H. RP_3, P661.158.


A
B
C
D
E
F
G
H

wall of the tooth, and shows an anterolingual fold into which P^2 fit. In P661.147, the less worn specimen, a hint of buccal separation of the posteroloph remains, and the central and buccal lobes are connected by a thin anteroposterior isthmus. Lingual hypostriae, as in all P^4-M^2 at hand, are very shallow. The anterobuccal root is fused to the lingual column, and the posterobuccal root is free.

P^4, M^1, and M^2 have free buccal roots. The prominent buccal cusp is the most persistent feature in these teeth, and lingual hypostriae disappear early in wear. Columns are moderately curved, and unilateral hypsodenty is well developed: on the least worn specimen at hand (P661.149), the height of crown buccally is 1.5, lingually 6.6.

M^3 is only slightly unilaterally hypsodont, has a short lingual hypostria, and in P661.155 shows a small central lake.

The least worn P_3, P661.157 (Fig.1H) shows the lingual valley extending to within 1 mm of the crown base, and the posterolophid is separate lingually to nearly that depth. The anterolingual corner of the crown is reduced, and the anterolingual fold is sharp at the worn surface, persisting to about the depth of the lingual valley but becoming more gentle toward the crown base. This tooth is more hypsodont buccally (4.6) than lingually (2.7).

At the maximum extent seen in the present sample only about 2 mm of enamel was formed beneath the base of the buccal valley in P_3. The least worn P_3 from Calf Creek, P661.157, is strongly rooted.

In worn P_3 (Fig.1F,G), anterolingual corners become more reduced, lingual valleys and anterolingual

folds disappear, and buccal valleys shorten.

Posterolophids were evidently well developed in little-worn P_4 - M_2, and in a representative specimen (P1585.507) the buccal groove setting off the posterolophid persists to within 3 mm of the crown base. The anterior edge of the talonid is crenulated. All P_4 - M_2 in the Calf Creek sample are moderately o. heavily worn, and features of the early wear stages a-e not available for description.

The only M_3 at hand generally resembles a reversed P_3. The tooth is moderately worn, and the lophids are strongly joined lingually, with no visible trace of the lingual valley.

Discussion: *Megalagus* near *M. brachyodon* shows the same size as in the type sample of *M. brachyodon* from Pipestone Springs, Montana. It shows lower crown height for P^2, and a persistent lingual valley and anterolingual fold in P_3, both "primitive" characteristics that resemble *Mytonolagus*. The Calf Creek population is distinctly more "primitive" than *M. brachyodon* from Pipestone Springs or Flagstaff Rim, Wyoming, in details of P^2 and P_3.

The Calf Creek Local Fauna does not contain skulls or mandibles of *Megalagus* that could indicate whether this population is distinct enough to warrant designation as a separate species. Therefore I use the device *"Megalagus* near *M. brachyodon."*

Measurements: dP^2, AP(2), mean 1.4, OR 1.3-1.5; BL(2), mean 2.0, OR 1.8-2.2. P^2, AP(9), mean 1.6, OR 1.4-1.9, CV 12.5; BL(9), mean 2.3, OR 1.9-2.6, CV 13.0. P^3, AP(2), mean 2.6, OR 2.5-2.7; BL ant (2), mean 4.0, OR 3.7-4.3; BL post (2), mean 4.8, OR 4.6-4.9.

P^4, AP(3), mean 2.7, OR 2.6-2.8; BL ant (3), mean 4.8, OR 4.5-5.1; BL post (3), mean 4.9, OR 4.4-5.1. M^1, AP(2), mean 2.3, OR 1.9-2.7; BL ant (1), 5.5; BL post (1), 5.5. M^3, AP(1), 1.3; BL(1), 2.4. P_3, AP(3), mean 2.5, OR 2.5-2.5; BL tri (3), mean 2.5, OR 2.3-2.7; BL tal (3), mean 2.8, OR 2.5-3.0. P_4 or M_1 or M_2, AP(24), mean 3.3, OR 2.6-3.8, CV 9.1; BL tri(24), mean 3.4, OR 3.0-3.9, CV 5.9; BL tal (25), mean 2.6, OR 2.3-2.9, CV 7.7. M_3, AP(1), 1.8; BL tri(1), 1.9; BL tal(1), 1.6.

CONCLUSIONS

Two lagomorphs, *Palaeolagus temnodon* and *Megalagus* near *M. brachyodon*, are present in the Calf Creek Local Fauna. No material referable to the third expected genus, *Chadrolagus* (Gawne 1978) was observed.

Palaeolagus temnodon from Calf Creek shows higher frequencies of "primitive" variants in occlusal pattern of P^2 and P^3 than do the populations from Flagstaff Rim, Wyoming and Pipestone Springs, Montana. *Megalagus* near *M. brachyodon* exhibits lower crown height in P^2, and "primitive" retention of the lingual valley and antero-lingual fold in P_3, as compared with *M. brachyodon* from Flagstaff Rim and Pipestone Springs.

It is always difficult to know, in comparing faunal assemblages, whether differences result from temporal or geographical separation. The relatively "primitive" characteristics of both Calf Creek lagomorph populations are, however, consistent with my previous conclusion (Storer 1978), based on the Calf Creek rodents, that this local fauna is older than the Middle Chadronian Pipestone Springs Local Fauna.

The Calf Creek Local Fauna may also be slightly

older than faunas from the 75 metre level and above at Flagstaff Rim (Gawne 1978, fig.7), if lagomorphs are a reliable indicator of correlation.

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REFERENCES

Dawson, M.R. 1970. Paleontology and geology of the Badwater Creek area, central Wyoming, Part 6. The leporid *Mytonolagus* (Mammalia, Lagomorpha). Annals of Carnegie Museum, 41(7): 215-230.

Gawne, C.E. 1978. Leporids (Lagomorpha, Mammalia) from the Chadronian (Oligocene) deposits of Flagstaff Rim, Wyoming. Journal of Paleontology, 52(5): 1103-1118.

Russell, L.S. 1972. Tertiary mammals of Saskatchewan. Part 2: the Oligocene fauna, non-ungulate orders. Life Sciences Contributions, Royal Ontario Museum, 84: 97p.

Storer, J.E. 1978. Rodents of the Calf Creek Local Fauna (Cypress Hills Formation, Oligocene, Chadronian), Saskatchewan. Natural History Contributions, Saskatchewan Museum of Natural History, 1:54p.

Wood, A.E. 1940. The mammalian fauna of the White River Oligocene. Part 3. Lagomorpha. Transactions of the American Philosophical Society, new series, 28(3): 271-362.